Tandem radial-junction silicon nanowire solar cells fabricated by PECVD

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The conversion efficiency of radial junction cells involving hydrogenated amorphous silicon (a-Si:H) absorber layers has continuously been improved in the last four years: 4-5% using In catalysts [1], 6%, 7-8% and 9.7% using Sn catalysts [2-4]. An advanced tandem structure based on the same radial-junction silicon nanowire (SiNW) architecture is now being investigated in the framework of the ANR project "SOLARIUM". My thesis work aims at fabricating of tandem radial junction SiNW based solar cells combining a-Si:H and microcrystalline silicon (µc-Si:H) materials. In parallel to the ongoing optimization of the bottom cell (p-i-n SiNW-based µc-Si:H), we explore new strategies to control the size and the density of Sn catalysts in order to fulfill the requirements for the growth of tandem structure illustrated in Fig.1. A review of the key processes involved in the fabrication of the tandem radial junction solar cell, including the control of the catalyst, the growth of SiNWs and of absorbed layers will be presented.

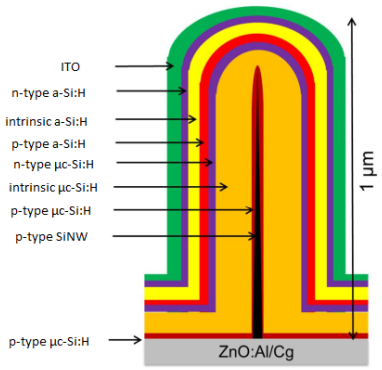

Figure. 1: Schematic illustration of a cross-section of µc-Si:H/a-Si:H tandem radial junction solar cell.

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